CHAPTER 1. HISTORIC CONDITIONS IN THE SAMMAMISH WATERSHED

In order to identify the most appropriate and effective restoration measures for use within the Sammamish River Corridor, it is instructive to review historic watershed conditions, as well as anthropogenic changes that have occurred over the past 120 years. This assessment summarizes available information from 1859 through approximately the 1960s, when the last of the major changes occurred to the river (not including continued urban development). Information for conditions prior to European settlement is available from only a few sources (primarily the General Land Surveys of 1859 and histories of the Sammamish Valley such as Stickney & McDonald 1977).

Historically the Sammamish River Corridor was a place of vast wetlands, numerous meandering and braided channels, and old growth forest. The frequent flooding made it seasonally habitable, during the dry season. The extremely complex system of emergent, shrub, and forested wetlands, and multiple channels provided significant rearing opportunities for salmon species, and ideal habitat for large and small mammals and birds. It is unlikely, however; that extensive spawning areas were present in the river due to its flow characteristics and gradient but all other aquatic and floodplain habitat types (such as side channels, pools, emergent, shrub and forested wetlands,) were present in abundance. Significant human-induced changes have been incurred in the Sammamish River Corridor since Europeans began to settle in the area in the 1880s. Lake Washington was lowered nine feet and Lake Sammamish by six feet when the Hiram Chittenden Locks (hereafter referred to as the locks) were built; the vast forested areas of the valley and surrounding hillsides were logged; the river was confined to one channel, wetlands were drained for agriculture; and in the 1960s the river was further constrained for flood and now has uniform aquatic habitat and essentially no riparian area. Details are provided below.

FLOODPLAIN AND RIPARIAN VEGETATION

The Sammamish River Corridor is approximately 12 miles (19.2 km) in length and the floodplain varies in width from nearly one mile (1.6 km) in the upper two-thirds to approximately 1,000 feet (303 m) wide near Bothell (see Figure 1). Prior to European settlement, the Sammamish River floodplain was primarily wetland, (General Land Survey Office 1859; General Land Office 1884; USGS 1897) and heavily vegetated with a diverse mix of plant communities (see Figure 2). Communities likely included emergent, shrub, and forested wetland, and riparian and upland forest, although wetland habitat likely dominated most of the valley floor (as evidenced in GLSO 1859). Common plant species noted anecdotally by early settlers included cranberry (possibly *Viburnum edule*), wild crabapple (*Malus fusca*), hazelnut (*Corylus cornuta*), nettle (*Urtica dioica*), marshgrass (possibly *Carex* species), cattail (*Typha latifolia*), cedar (*Thuja plicata*), alder (*Alnus rubra*), fir (*Pseudotsuga menziesii*), hemlock (*Tsuga heterophylla*), and several species of willow *(Salix* sp.) (Washington Native Plant Society [WNPS] 1994; Stickney and McDonald 1977; Johnston and Johnston 1976). Photographs from the turn of the century show massive old growth cedar, Douglas fir, hemlock, and numerous cottonwood (*Populus balsamifera*), willow, and alder (Stickney and McDonald 1977; McDonald 1976).

It is likely that several types of natural, low-elevation wetland communities (as identified in Kunze, 1994) were present in the Sammamish River Corridor because of its low gradient, frequently flooded nature, including variations of the following: (1) sphagnum bog, shrub-dominated (still present adjacent to tributary streams and on Sammamish plateau, may not have been present in the Sammamish Corridor itself); (2) minerotrophic[1] permanently flooded (oxbows, behind beaver dams, etc); (3) minerotrophic seasonally

[1] Minerotrophic wetlands have inflows of moderate quantities of nutrients and minerals from mineral-rich groundwater, natural streams, and/or rainfall.

flooded, herb-dominated; (4) minerotrophic seasonally flooded, shrub-dominated; and (5) minerotrophic seasonally flooded, tree-dominated. Typical dominant species assemblages in each community are shown in Appendix A. It is likely that all but the sphagnum bog, shrub-dominated wetland types were very common in the Sammamish Valley historically.

Typical wetland community plant species are listed below as derived from the Washington Native Plant Society's (WNPS 1994) list of plants collected in the Puget Sound area in the 1850s and Kunze (1994). Emergent wetlands likely contained several species of sedge that are typically found in undisturbed native wetlands in western Washington, including *Carex aquatilis, C. cusickii, C. obnupta, C. lenticularis,* and *C. stipata;* rush species such as *Juncus effusus, J. acuminatus, J. ensifolius,* and *J. mertensianus;* and other emergent wetland species such as *Alisma plantago-aquatica, Eleocharis palustris; Scirpus acutus, S. microcarpus; Polygonum amphibium* and *Typha latifolia*. Shrub wetland and riparian areas likely included such species as spirea (*Spirea douglasii),* vine maple *(Acer circinatum),* red-osier dogwood (*Cornus sericea),* red alder, salmonberry (*Rubus spectabilis),* twinberry (*Lonicera involucrata),* willow *(Salix lasiandra, Salix scouleriana),* Labrador tea (*Rhododendron groenlandicum),* and bog laurel (*Kalmia polifolia).* Forested wetland and riparian areas likely included such species as red alder, cottonwood, Oregon ash (*Fraxinus latifolia),* red cedar, western hemlock, big-leaf maple (*Acer macrophyllum),* Douglas fir, snowberry (*Symphoricarpos albus),* red elderberry *(Sambucus racemosa),* impatiens *(Impatiens noli-tangere),* and skunk cabbage (*Lysichiton americanum).*

The floodplain contained numerous channels, sloughs, and oxbows from the highly braided river channel, and the entire valley flooded almost yearly. Navigation reports from the late 1800s indicate it was very difficult to discern the main river channel from the numerous blind channels within the valley floor. Large woody debris (LWD) was also very abundant and a hazard to navigation as recently as the early 1960s (Stickney & McDonald 1977; various newspaper articles). Since the river had limited transport capacity, it is likely that wood from tree fall adjacent to the river and wood transported down the tributaries accumulated in large quantities in the mainstem. Large jams may have formed at, or immediately downstream of the tributary mouths.

HYDROLOGY

The Sammamish River and Lakes Washington and Sammamish, occupy glacially scoured troughs from the most recent glaciation (~10,000 years before present). The Sammamish River flows primarily northward from Lake Sammamish for approximately ten miles and then turns westward for another four miles starting near Woodinville. The North Creek Valley that continues as a northern extension of the Sammamish River Corridor historically contained an extensive wetland area (General Land Office 1859 and 1897; Stickney & McDonald 1977) and likely is the location of the anecdotal "third lake" that may have existed in the valley. The City of Bothell has recent soil information that shows extensive layers of diatomaceous earth in the vicinity of North Creek, which is typically derived from diatom deposition in a lake or marine environment (B. Blackburn, City of Bothell, pers. comm. 2001).

Historically, the Sammamish River was the primary tributary to Lake Washington, and the level of Lake Washington fluctuated annually by several feet (from elevation 18 to 27 feet [5.4 to 8.2 m] [National Geodetic Vertical Datum 1929]; Ajwani 1956). Historically the median lake level was about 8 to 9 feet (~2.5 m) higher than its current mean elevation (historical mean elevation of about 22 feet [6.7 m]; current mean elevation of about 14 feet [4.2 m]). The Sammamish River Corridor ranges in elevation from 20 feet (6 m) at Kenmore to about 28 feet (8.5 m) at Marymoor Park, suggesting that the lower half of the corridor was on average flooded to a depth of 2 feet (0.6 m). During high water conditions, the entire valley floor was flooded. Stickney and McDonald (1977) point out that during foggy weather or wintertime, riverboat operators could not find the river channel amongst the numerous flooded channels that existed and would typically tie up to a snag and wait for better visibility. Water levels in Lake Sammamish were also directly tied to the level of Lake Washington and fell significantly when Lake Washington dropped below 20 feet in elevation (6 m). The river gradient was even less than it is today due to the approximate 30-mile (48 km)

length of the main channel and less elevation difference between Lakes Washington and Sammamish (Chrzastowski 1981).

Lake Sammamish has likely always had warm epilimnetic (surface) water temperatures during the summer months primarily associated with thermal stratification of the shallow lake and the hydraulic retention time of the lake. The outflow temperature from the lake to the Sammamish River would have been elevated as a result of these conditions, similar to the existing situation. J.G. Cooper (WNPS 1994) describes the rivers of western Washington in the 1850s as typically having low temperatures (<52°F [11° C]) throughout the summer and uniformly very clear water, except those fed by glacial meltwater. He does not specifically refer to the Lake Washington watershed, however, other than describing the Black River as an area of significant wetlands. However, since the Sammamish River is fed by lake outflow it was not likely to have ever had low temperatures like other river systems. Since no data are available, we can only speculate on what temperatures in the Sammamish River may have been. We do know that the Sammamish River Corridor had very dense forest and shrub vegetation in the floodplain and riparian areas which would have shaded most of the river (particularly because of the numerous small braided channels that could be completely shaded more easily than the existing wide single channel), thus providing some measure of cooling and preventing additional heating. Additionally, there were likely numerous groundwater inflows associated with the vast wetland complex in the corridor, as well as typically higher flows in the tributaries (prior to impervious surfaces and more rapid runoff) that would have provided much more significant cooling than current conditions provide. Also prior to initiation of water withdrawals from the river there may have been higher flows in both the tributaries and the mainstem, which would have been less susceptible to heating (it takes more heating to increase the temperature of a larger volume of water).

Historically, Bear Creek entered the Sammamish River very near the outlet of Lake Sammamish (in Marymoor Park), approximately 0.7 miles (1.1 km) upstream of its existing outlet. Therefore, the length of the reach over which river temperatures were similar to lake surface temperatures would have been much shorter. The inflow from Bear Creek would likely have been at least as cool if not cooler than today. Therefore, a temperature decrease below the confluence of Bear Creek of a few to several degrees centigrade would be expected depending on flow. The historical temperature of the river below Bear Creek would depend on a number of factors that include residence time in the river, the amount, type, and distribution of streamside vegetation, and the historical flow regime and temperature of other tributary and groundwater inputs. Although it is likely mainstem river temperature was generally much lower that it is today, we cannot be certain it was not similar to the current conditions (depending on the above factors, see Chapter 2 for current conditions). What can be said with some certainty, however, is that the historical river channel and associated network of wetlands, tributaries and side channels provided a greater variety of temperature conditions (especially cool water refuges) than at present. In addition, due to the old growth forest characteristics of the watershed, the tributaries would have likely experienced cooler temperatures.

HABITAT CHARACTERISTICS

Habitat for salmon and other native fish species in the Sammamish River was likely diverse prior to European settlement. Stickney and McDonald (1977) mention the presence of numerous logs and LWD jams in the river that impeded navigation, in addition to the presence of numerous side channels and oxbows off the main channel. The LWD likely caused formation of numerous deep pools that served as refuge and habitat for rearing. The dense and diverse vegetation communities would have further provided opportunity for juvenile fish rearing and refuge in the slow-moving river. It is unlikely, however, the mainstem provided significant habitat for spawning (such as the Cedar River) due to the very low gradient. It is likely however that the mainstem river supported some smaller areas suitable for spawning, particularly at tributary mouths where gravel may have deposited or where groundwater upwelling may have occurred. Also, the connection with two major lakes and several significant tributaries provided an additional array of habitat types for salmon to utilize. Coho, steelhead, sockeye, and cutthroat seek out and utilize side sloughs and channels, tributaries, and spring-fed seeps for rearing (Kerwin 2001). The river may have been the primary rearing

area utilized by chinook, coho, steelhead, and cutthroat in the Sammamish watershed due to the complex cover and numerous sloughs, side channels and wetlands, whereas the lakes are typically primary rearing areas for sockeye and kokanee. Cutthroat trout use a wide variety of habitats including lakes and small and large streams or rivers and likely utilized the mainstem Sammamish River extensively. It is unknown, however, if bull trout historically present in the watershed were anadromous. If so, they may have primarily been present in Bear and Issaquah Creeks (coldest water temperatures) and migrated through the Sammamish River. They prefer highly complex habitat with extensive cover (USFWS 1999), which would have been present throughout the mainstem.

Tributaries historically provided spawning and rearing habitat for chinook, coho, steelhead, and cutthroat and bull trout. Bear, Swamp, and North Creeks all contained significant wetland areas (based on historic maps and aerial photos such as GLSO 1859) that would have provided a diversity of habitats, as well as serving to maintain fairly constant year-round flow conditions. All of the tributaries to the river are lowland stream systems that would not have experienced the typical hydrologic extremes of spring snowmelt runoff or winter rain-on-snow flooding. Issaquah Creek, which is a tributary to Lake Sammamish, is the only sub-basin originating in the Cascades, but still has generally lowland stream flow characteristics because its headwaters are at approximately 2000 ft (600 m), which is below the usual snow-pack elevation.

The mosaic of wetland, riparian, and upland habitat in the Sammamish Valley would have also provided a diversity of habitat for numerous waterfowl and birds, as well as small and large mammals, amphibians, and reptiles. Habitat would have varied from open water and ponded wetlands to saturated wetlands, riparian, and upland forests. Early accounts indicate the valley was primarily forested swampland (Stickney & McDonald 1977). As evidenced by photos of logging during the early 1900s (Stickney & McDonald 1977), most coniferous forested areas were likely in old growth conditions, which would have provided suitable habitat for species now rare or extinct in the lowlands, including bat, cougar, grizzly bear, gray wolf, marbled murrelet, fisher, and others.

As previously indicated, there are no historic water quality data available other than anecdotal accounts from other watersheds (WNPS 1994). Historically, there was likely great variability in water temperatures throughout the corridor (very cool in the tributaries [<60°F or 15.5°C] and numerous cool water refuges in spite of the likely elevated Lake Sammamish surface temperatures). Otherwise, water quality is presumed to have been of good quality to support all native fish and wildlife species.

DESCRIPTION OF FISH SPECIES AND POPULATIONS

Prior to significant human-induced changes in the watershed, Lake Washington had its outflow through the Black River and into the Green/Duwamish watershed. An initial cut to connect Lake Washington to Lake Union was made near Montlake as early as 1886 (Ajwani 1956) for log transport purposes; it is unlikely however, that anadromous fish were able to use this access to the lake. The Washington Conservation Commission (Kerwin 2001) recently prepared the best reconstruction of historic fish species present in the watershed. Fall chinook, coho, sockeye, kokanee, steelhead, cutthroat trout, and bull trout are likely the only salmon species that were historically present in the Sammamish subwatershed, although spring chinook, pink, and chum salmon were likely present in the Cedar River and may have entered Lake Washington. Other species such as white sturgeon, mountain whitefish, northern pike minnow, suckers, peamouth, sculpins, sticklebacks, and lamprey were likely present as well. Early reports of fish in the watershed indicate kokanee were abundant, and significant quantities of eggs were taken from Lake Washington/Lake Sammamish kokanee to stock other watersheds in the state (Kerwin, 2001). Stickney and McDonald (1977) indicate fish (not identified) were abundant in Squak Slough (former name of Sammamish River) and Lake Sammamish and were a primary food source for Native Americans, which is also reiterated by Buerge (1984), that the kokanee fishery was tremendous and tribes from around Puget Sound came to fish during the spawning runs. Actual population sizes of the various salmonid species are not known, but were likely quite significant, as there were several native villages around Lake Washington and at the mouth of the Sammamish River that extensively utilized the various fish species (Buerge, 1984). Kokanee egg take data

from the turn of the century (Kerwin 2001) indicate there were many tens of thousands of kokanee at that time.

Fish species in the Sammamish sub-watershed (Lake Sammamish and Sammamish River and tributaries) would have likely evolved to tolerate cool water temperatures and to use a variety of habitats including wetlands, sloughs, floodplains, and channels similarly to fish in other western Washington systems. Lowland- and wetland-dominated systems can be very productive for coho and steelhead and cutthroat trout. Chinook were not likely abundant in the Sammamish sub-watershed due to lack of a large river system with extensive spawning areas and the presence of two relatively large lakes that are typically not preferred rearing areas for chinook (Healey 1991). However, populations that did occur had excellent rearing opportunities in the Sammamish River Corridor.

Freshwater mussels (presumed to be the western pearlshell [*Margaritifera falcata*]) still occur in Bear Creek (Fevold & Vanderhoof 2002) and it is likely several native species of freshwater mussels and clams were historically present in the Sammamish River Corridor in the shallow ponds and side channels of the floodplain (such as Oregon floater and other species). Freshwater mussels are considered indicative of high quality stream habitat because they require clean gravel and sand and for part of their life history they are parasitic on salmonid species (Fevold & Vanderhoof 2002).

There is no data available on the historic aquatic invertebrate populations, but the highly diverse wetland, river, slough complex would likely have supported abundant populations of both terrestrial and aquatic insects and other invertebrates. There was a diversity of substrate type and extensive overhanging and emergent vegetation. The corridor would likely have produced abundant food sources for all salmonid species and other resident fish.

WILDLIFE

There is very little information on historic wildlife populations in the Sammamish River Corridor. Based on the previous discussion that the valley was a mosaic of old-growth forested swamps, emergent and scrub-shrub wetlands and adjacent old-growth fir and hemlock uplands, all native wildlife species that utilize these lowland habitat types would have likely been present. Marshes and riparian areas would have provided additional habitat for migratory birds, and proximity to lakes would have further attracted waterfowl. Table 1, below, lists many of the wildlife species that may have historically been present in the Sammamish River Corridor. This list is derived from a review of native wildlife species distribution and habitat requirements and judgment of wildlife biologists (Corkran & Thoms 1996; Csuti, *et al* 1997; Kruckeberg 1991; Maser 1998; National Geographic Society 1985; K. Brunner, ACOE, pers. comm. 2001)

Table 1. Wildlife species that may have historically (pre-European settlement) been present in the Sammamish River corridor
(Not intended to be entirely inclusive)

Mammals	Western pond turtle	**Birds (cont.)**
Grizzly bear	Various snakes	Merlin
Black bear	**Birds**	Peregrine falcon
Cougar	Pied-billed grebe	Ruffed grouse
Elk	Great blue heron	Band-tailed pigeon
Black-tailed Deer	Tundra swan	Owls (great-horned, spotted, screech, pygmy, saw-whet)
Gray wolf	Canada geese	Rufous hummingbird
Coyote	Mallard	Belted kingfisher
Mink	Teal (green-winged, blue, cinnamon)	Northern flicker
Fisher	American wigeon	Woodpecker (downy, hairy, pileated)
Long-tailed weasel	Northern pintail	Flycatcher (olive-sided, Hammond's, willow, Pacific-slope)
Porcupine	Ruddy duck	Western wood pewee
Beaver	Wood duck	Swallows (tree, violet-green, barn, cliff, northern rough-winged)
Mountain beaver	Lesser scaup	Purple martin
River otter	Barrow's goldeneye	Steller’s jay
Muskrat	Common goldeneye	Magpie, crow, raven
Bobcat	Bufflehead	Chickadee (black-capped, mountain, chestnut-backed)
Raccoon	Mergansers (common, hooded)	Bushtit
Red squirrel	Virginia rail	Wren (house, winter, Bewick's, marsh)
Western cottontail rabbit	Sora	Kinglet (golden-crowned, ruby-crowned)
Bats	American coot	Thrush (Swainson's, hermit, varied)
Voles	Long-billed curlew	American robin
Shrews	Greater yellowlegs	Cedar waxwing
Amphibians/Reptiles	Snipe	Vireos (Cassin’s, red-eyed, Hutton’s, warbling)
Northwestern salamander	Gulls (Bonaparte’s, ring-billed, mew, herring, CA, glaucous, Thayer’s, western)	Warblers (orange-crowned, yellow, yellow-rumped, Townsend's, Wilson's, MacGillivray’s, black-throated gray, Nashville)
Long-toed salamander	Marbled murrelet	Common yellowthroat
Roughskin newt	Golden eagle	Yellow-breasted chat
Pacific giant salamander	Bald eagle	Black-headed grosbeak
Ensatina	Northern harrier	Lazuli bunting
Van Dyke's salamander	Sharp-shinned hawk	Spotted towhee
Western redback salamander	Cooper's hawk	Sparrow (savannah, song, golden-crowned, white-crowned, fox, Lincoln’s, vesper)

Table 1. (Continued)		
Western toad	Northern goshawk	Red-winged blackbird
Pacific treefrog	Red-tailed hawk	Western tanager
Red-legged frog	Osprey	Finches (American, pine siskin, red crossbill, purple)
Spotted frog	American kestrel	

NATIVE AMERICAN PRESENCE AND USE OF THE SAMMAMISH RIVER CORRIDOR

All information in this section is summarized from Buerge (1984) and Stickney and McDonald (1977*)*. The Lake Washington basin was highly productive of fish, birds, mammals, and a variety of edible plants and several native winter villages were located along the Lake Washington lakeshore and adjacent to tributaries including the Sammamish River. There was also extensive native use of Lake Sammamish. A village was located at the mouth of Sammamish River and was known to be occupied by the "willow people" as described by early European settlers. There are also extensive archaeological sites in and adjacent to Marymoor Park at the upper end of the river. The native tribe around Lake Sammamish was generally known to the settlers as the Squak people (the Sammamish River was called Squak Slough). It is unknown, however, if winter villages were present in the Sammamish valley because of the frequent flooding that occurred. It is likely there were summer camps and other uses by native Americans because of the extensive fish runs that used the corridor. There could have been more extensive use of the corridor by tribal populations than was noted by early settlers because many native peoples are believed to have been decimated by smallpox and other diseases as a result of early trappers and explorers (Hudson Bay Company, etc.), prior to most settlement.

HUMAN-INDUCED CHANGES TO THE RIVER AND BROADER WATERSHED

From the time the first European settlers began moving into the Sammamish Valley to the present day, significant changes have occurred to the system's hydrology, floodplain, and aquatic and terrestrial habitats. The first settlers moved into the valley in the 1870s (Stickney and McDonald, 1977) and almost immediately began clearing the upland forest for both timber and farmland. The Sammamish River was a major route for transporting logs down to Kenmore and across Lake Washington. The heaviest logging activity occurred from the 1880s through about 1900. In photos around 1903 (Stickney and McDonald, 1977), the valley and surrounding hillsides are nearly devoid of trees.

Following the logging boom, more and more settlers moved into the valley for farming and other ventures. As early as 1892 (King County Testimony and Petitions 10/12/1895; 9/26/1892; 3/20/1895; 8/20/1892; 9/21/1892; 1/11/911), the settlers were trying to form a drainage district and straighten and deepen the river channel to its approximate existing alignment (see Figure 2). Landowners downstream of Hollywood were opposed to initiation of the drainage district because they would be taxed and thought deepening the river would not solve their continuing flooding problems due to backwater conditions from Lake Washington. These landowners advocated lowering Lake Washington as a better alternative. When plans for building the Lake Washington Ship Canal were initiated in 1910 by the Corps of Engineers, King County, and the City of Seattle, there was an initial plan to appropriate $25,000 for deepening the Sammamish River to coincide with the lake lowering (Stickney and McDonald 1977). The deepening plan did not come to fruition, however, and a drainage district was formed in 1911 (King County 1911). Residents considered the debris jams and sand and gravel bars within the river as unreasonable restrictions on navigation and other uses and subsequently began the process of widening and "brush" removal.

The locks and Lake Washington Ship Canal were completed in 1917, and Lake Washington was slowly lowered about 9 feet (2.7 m) over the construction period, with a subsequent drop in Lake Sammamish elevation of approximately 6 feet (1.8 m). Ajwani (1956) states that following the lowering of the lake, the

Sammamish River had a stronger current, and many areas of the valley floor that were formerly submerged or otherwise wet were drained and placed under cultivation. The drainage districts continued to implement incremental straightening and deepening projects throughout the Redmond to Woodinville reach, primarily in the early 1920s. By 1938 (USACE map 1938), the river essentially existed in its current alignment, and the majority of the floodplain was under agricultural production; however, portions of the old channel alignment still existed as shrub wetland habitat (King County aerial photos ~1940). The river was also dredged sometime before 1950 (Ajwani 1956) to provide navigation for small boats. It is unclear who conducted the dredging (possibly the drainage district or King County). Ajwani (1956) considered the dredging to have destroyed habitat for trout and salmon, which included spawning habitat in several areas of the river, with the higher gradient from the lowered lake level.

In spite of these significant alterations, the Sammamish floodplain still experienced a high groundwater table and frequent flooding that impeded early season crops and made much of the floodplain undesirable for residential or commercial development. In the 1950's King County requested that the Corps investigate a flood control project to prevent spring flooding of croplands (USACE, 1962). The Corps undertook a feasibility study that recommended deepening of the river to facilitate drainage and to contain flows up to a 40-year event after March 1.[2] The Corps completed this project in 1964, which deepened the river by approximately 5 to 10 feet and also included minor straightening near North Creek (for Highway 522 construction) and elimination of a couple of meanders upstream of Woodinville. A levee was also constructed along lower North Creek. The dredged material was typically sidecast to fill in low spots (probable wetlands) and form short berms along the banks, providing additional flood protection that exceeded the design event in some areas. During construction, essentially all riparian vegetation was removed, and the design standard was for a grass-lined channel, which King County is obligated to maintain. This was the final major alteration to the river channel, to date. There is no levee system along the Sammamish River, but rather areas of sidecast material from the channel improvement project that filled in low elevation floodplain areas. Rock bank protection was also placed as part of the Corps/King County project to protect bridges and some banks, in approximately 50% of the channel.

Following completion of the Corps/King County flood control project, the floodplain gradually began to transition from agricultural use to residential, commercial, and industrial uses. A significant proportion of the former floodplain is now developed (estimated at ~45%; not including agriculture or park lands). Based on the comprehensive plans of King and Snohomish Counties and associated cities approximately 57% of the overall Sammamish watershed is planned for urban growth (King County Office of Regional Policy and Planning 2001; Snohomish County Department of Planning and Development Services 2000). The Swamp and North Creeks sub-basins are almost entirely planned for urban growth (Swamp Creek 100% and North Creek 99%). Much less of the Bear and Little Bear Creeks sub-basins are planned for urban growth--only 20% and 28%, respectively. Continued development will restrict restoration options in the future and could reduce existing high quality habitats without specific public acquisition or restoration actions.

In summary, the Sammamish River Corridor has undergone dramatic alterations since settlement began in the 1870s. Alterations include major hydrologic changes (lake lowering and channel deepening); urban, industrial, and agricultural development in the river corridor and surrounding watershed; timber harvest; stocking of non-native fish species; construction of in-channel structures such as weirs; channel realignment; and filling of remnant oxbows and floodplain areas. These alterations have eliminated most floodplain and wetland habitat in the corridor and seriously degraded riparian and in-stream habitat for fish and wildlife. The following chapter describes these existing conditions in more detail.

[2] The significance of the 40 year design event for flows after March 1st, is that the project was never designed to control winter flooding, only to facilitate crop growing in the springtime. Some flood control benefits have accrued to floodplain landowners over the years, particularly because portions of the channel may provide slightly higher protection than was originally designed (L. Smith & J. Lencioni, Corps of Engineers, pers. comm. 1999).

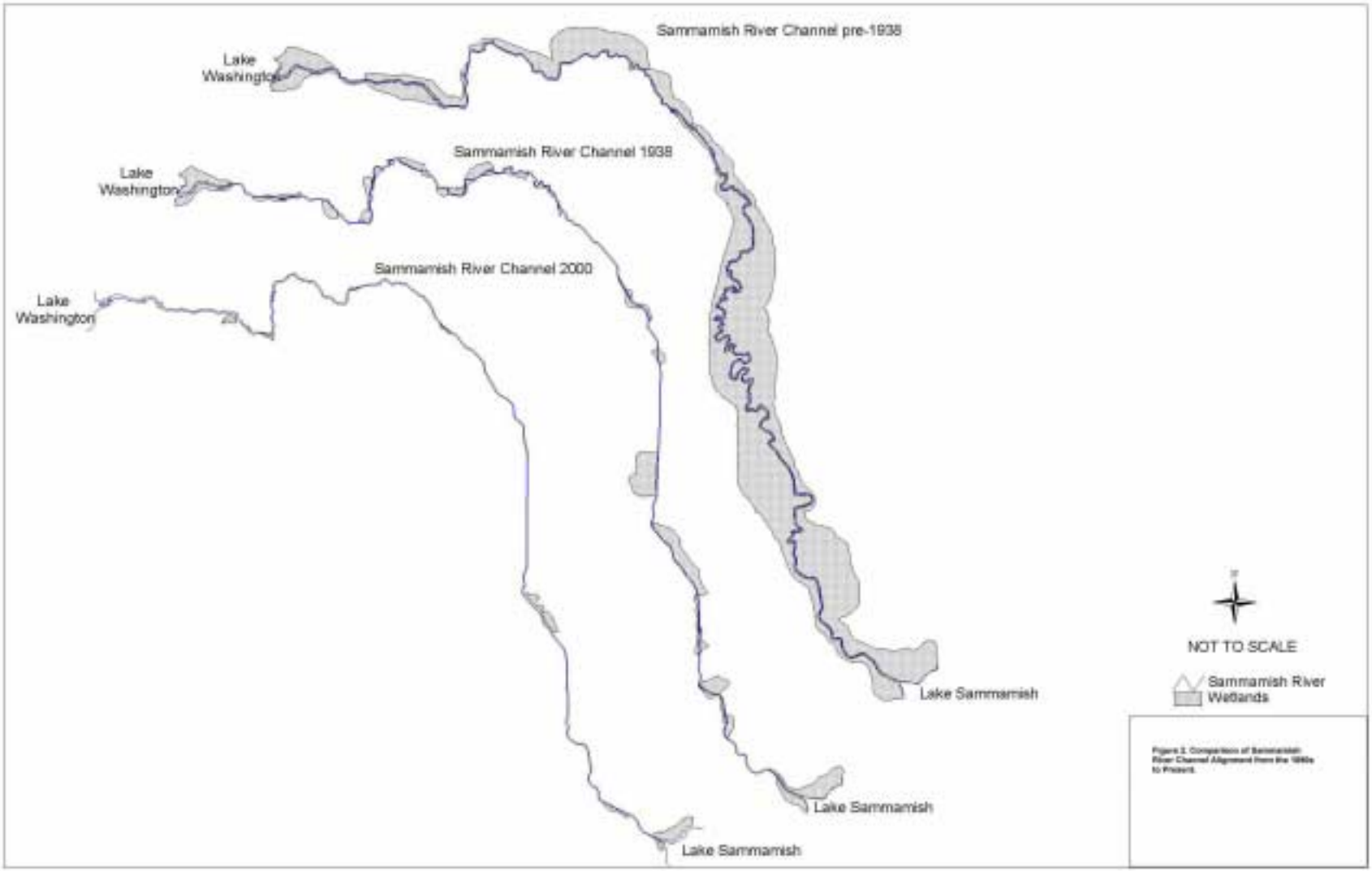

Figure 2. Comparison of Historic Channel Alignment with Existing Channel Alignment